

# SUPER TYPHOON HOPE (09)

The disturbance which eventually developed into the first super typhoon of 1979 became evident on satellite imagery at 250000Z July as a focal point of cumulus banding. Future intensification was indicated as the disturbance was situated within an area of strong upper-level diffluence associated with the southern periphery of an east-west oriented TUTT. This outflow mechanism aloft, combined with an improved satellite signature, dictated issuance of a Tropical Cyclone Formation Alert at 250751Z; the alert box described an area southwest of Guam. Subsequent aircraft reconnaissance at 250900Z described a cyclonic circulation with wind speeds of 15-25 kt (8-10 m/sec) and a central pressure of 1004 mb centered near 11.1N 144.5E. Based on this aircraft data and the proximity to Guam, the first warning on TD 09 (Hope) was issued at 251200Z.

From the 25th through the 26th of July, while TD 09 (Hope) tracked to the west-northwest; the TUTT axis shifted northward and strong upper-level northeast flow dominated the area. The resultant shear produced by this uni-directional upper-level flow displaced the convective activity to the southwest of the surface circulation, indicating a loss of vertical alignment and subsequent weakening. By 270600Z, the center of the convective activity was displaced 120 nm (222 km) southwest of the low-level circulation center. Surface analyses, at this time, indicated the southwest monsoonal flow was being channeled principally into Tropical Storm Gordon located 750 nm (1389 km) to the northwest of TD 09 (Hope). With further weakening of Hope expected, a final warning was issued at 270451Z advising that the area would be closely monitored for possible

regeneration. Post-analysis showed that from 271200Z through 280000Z, the TUTT weakened with resultant reduced shear over TD 09 (Hope). Conditions for development being improved, reorganization took place and TD 09 began to develop. Unfortunately, the improvement in the surface circulation went unnoticed as it occurred during the night when only infrared satellite imagery, on which low-level clouds are difficult to distinguish, was available. An aircraft investigation on the morning of the 28th reported a surface pressure of 999 mb with 45-50 kt (23-27 m/sec) winds in the heavy convective activity to the southwest of the surface center. A warning was issued at 280221Z indicating the regeneration of TD 09 (Hope).

By 280000Z, Tropical Storm Gordon had moved into the Luzon Straits. Due to the orographic blocking of the Philippine land mass, the majority of the strong southwest monsoonal flow was diverted into Hope. This increased low-level inflow coupled with decreasing upper-level shear resulted in a much improved vertical structure with feeder-band activity developing in the south; 282052Z aircraft reconnaissance supported this improved organization trend. Post-analysis indicates that TD 09 (Hope) could have been upgraded to tropical storm intensity 12-24 hours prior to the warning upgrade at 290000Z, as 35-45 kt (18-23 m/sec) winds were reported in feederband activity as much as 24 hours earlier (Fig. 3-09-1). By 290920Z, a well-defined eye with a central surface pressure of 972 mb and 65-70 kt (33-36 m/sec) surface winds were reported by aircraft data; the 291200Z warning upgraded Hope to a typhoon.

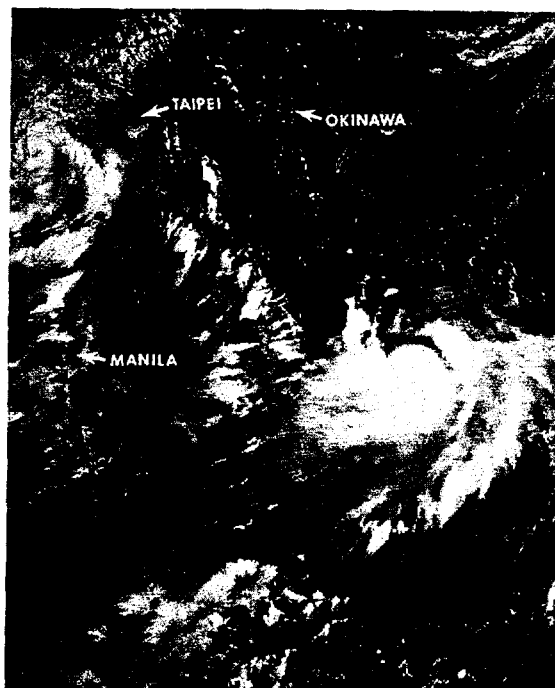


FIGURE 3-09-1. Hope (right) at tropical storm intensity 570 nm (1056 km) northeast of Guam, 29 July 1979, 0219Z. Tropical Storm Gordon (left) is 100 nm (185 km) east of Hong Kong. (DMSP imagery)

The 291200Z 200 mb analysis indicated the TUTT had again established itself north of Hope. Due to the east-west orientation of the TUTT, strong westerly flow along its southern periphery enhanced Hope's upper-level anticyclonic outflow. Aircraft reconnaissance at 292031Z indicated a sharp decrease in surface pressure to 961 mb with the temperature/dewpoint data correlating to an equivalent potential temperature ( $\theta_e$ ) of 359K. An empirically derived forecast aid that relates pressure and  $\theta_e$  indicates that once the traces intersect, rapid intensification can be expected within 18-30 hours (Fig. 3-09-2). The intensification equates to a possible mean pressure decrease of 44 mb and a mean wind speed increase of 50-60 kt (26-30 m/sec). Typhoon Hope verified this study 36 hours after the intersection occurred; reconnaissance aircraft reported a surface pressure of 898 mb and wind speeds of 100-120 kt (51-62 m/sec). By 311200Z, Hope attained super typhoon intensity of 130 kt (67 m/sec) (Fig. 3-09-3).

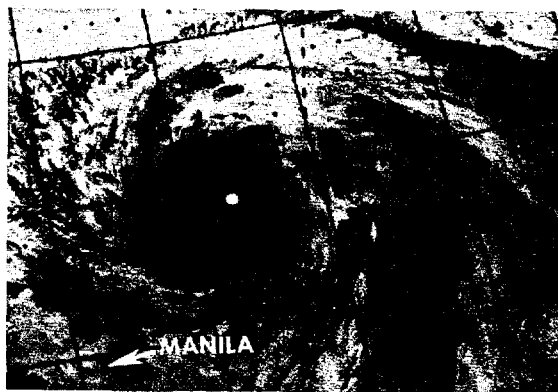


FIGURE 3-09-3. Infrared imagery of Hope just after attaining super typhoon intensity of 130 kt (67 m/sec), 31 July 1979, 1244Z. [DMSP imagery]

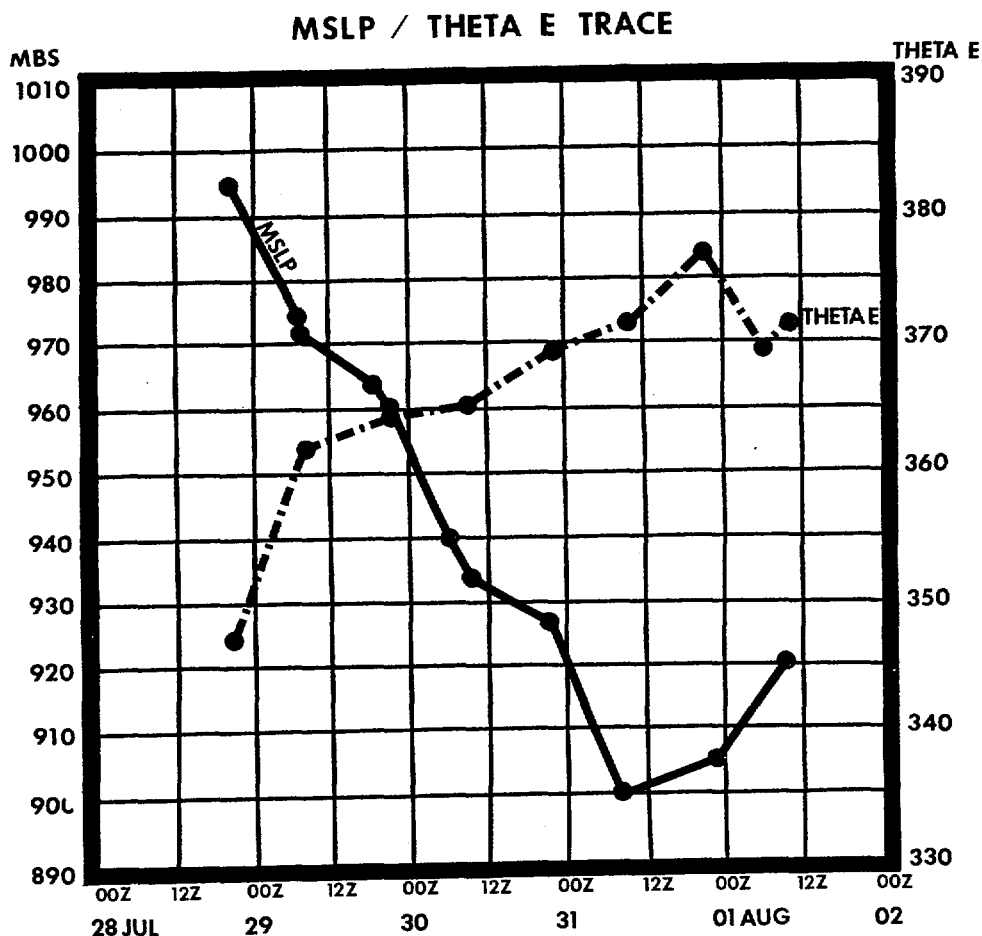


FIGURE 3-09-2. Time cross-section of Hope's minimum sea-level pressure versus equivalent potential temperature (THETA E ( $\theta_e$ )) derived from aircraft reconnaissance.

Hope entered the Luzon Straits approximately 4 days after Tropical Storm Gordon. Hope's compact wind structure and a slight weakening trend were noted as Heng Chun (WMO 46752) on the southern tip of Taiwan reported sustained winds of 40 kt (21 m/sec) with gusts to 86 kt (44 m/sec) at 011000Z as Hope passed 45 nm (83 km) south of the station. Two persons on the Batanes Islands and one person on Taiwan were killed as a result of the torrential rainfall experienced as Hope tracked through the Luzon Straits.

Typhoon Hope made landfall less than 10 nm (19 km) north of Hong Kong at 020530Z (Fig. 3-09-4) with maximum sustained winds of 70 kt (36 m/sec) and gusts to 110 kt (57 m/sec) reported. Figure 3-09-5 is a time sequence of the surface observations received from the Royal Observatory of Hong Kong during Hope's passage. Extensive wind and rain damage, 3 deaths and over 258 injuries were reported. Damage to shipping within Hong Kong harbor was heavy as 17 ships broke their moorings and 8 ships collided.

Subsequent to passage over Hong Kong, Hope moved into southern China and weakened. The final warning was issued at 030111Z downgrading Hope to tropical storm intensity. Hope's uncomplicated northwest track after development into a typhoon resulted in minimal right-angle track errors with her unexpected acceleration accounting for the majority of the discrepancy.

Although weakening considerably during passage over southeast Asia, Hope did maintain a satellite signature and exited into the northern Bay of Bengal 110 nm (204 km) southeast of Dacca, Pakistan at 060500Z.

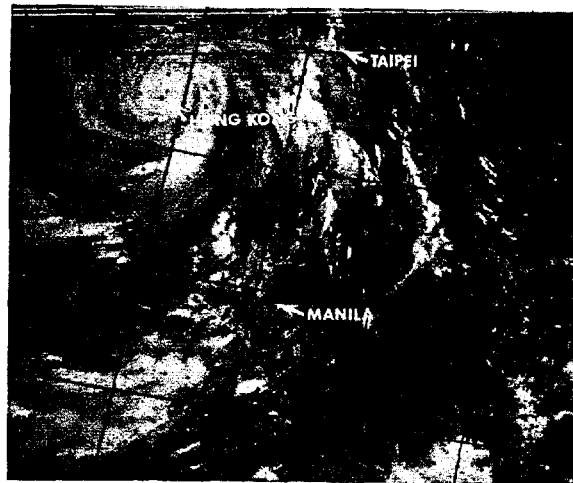


FIGURE 3-09-4. Typhoon Hope at 100 kt (51 m/sec) intensity, 3 hours prior to closest point of approach to Hong Kong, 2 August 1979, 0247Z. (DMSP imagery)

Strengthened once again by pre-existing strong southwest monsoonal flow, Hope reintensified from 070000Z through 071800Z with maximum sustained winds of 35 kt (18 m/sec) reported on 071200Z surface analysis. A tropical cyclone warning was not issued due to Hope's proximity to land and her expected movement into northeastern India within 12 hours. Hope, however, was discussed at length in the Significant Tropical Weather Advisory (ABEH PGTW).

45005 - HONG KONG OBSERVATORY				ST HOPE	DATE: 02 JULY 1979 / TIMES: 01-10Z				
02/01z	02/02z	02/03z	02/04z	02/05z	02/06z	02/07z	02/08z	02/09z	02/10z

FIGURE 3-09-5. Hourly surface synoptic observations from the Royal Observatory of Hong Kong (ROHK) during passage of Typhoon Hope.